Of course it is not to be expected that such a work should be altogether perfect, and if we indicate some of the points which strike us as susceptible of improvement, we do so in the hope that the work may gain still further in value when future editions are called for.

Whilst many of the illustrations are distinctly good, some are very much the reverse, and as an example of the latter class Fig. 40 may be cited, which is excessively bad, and can hardly be said to illustrate the text (which it certainly does not adorn) in any sense whatever. The story of the digestive functions attributed to the leaves of *Lathraea* is now generally discredited, and might as well have been omitted from the text, whilst the somewhat teleological explanation of the red colour in leaves perhaps might at least have been accompanied by suggestions as to the proximate causes of its appearance such as are indicated by Overton's recent experiments. It is, however, against the short chapter on the influence of the environment on plants that we incline to take the greatest exception. The subject is a large one, and can only be adequately, or even usefully, treated by the aid of copious illustrative examples, without which as in the present instance it is apt to degenerate into rather senseless cramming.

Apart, however, from what after all are but minor and easily remedied faults, the book is, as we have already said, a decidedly good one, and its author has displayed such excellent judgment in the selection of his materials in order to meet the special needs of the class of readers for whom it is primarily designed that there will in future be no excuse for that neglect of vegetable physiology which is at present but too common with junior students of botany. J. B. F.

A Text-book of Important Minerals and Rocks, with Tables for the Determination of Minerals. By S. E. Tillman, Professor of Chemistry, Mineralogy and Geology, U.S. Military Academy, West Point, N.Y. Pp. 176. (New York: John Wiley and Sons. London: Chapman and Hall, Ltd., 1900.)

IN this little manual, Prof. Tillman has brought together such fundamental instructions as are necessary to enable a beginner to determine the most commonly occurring minerals and rocks. Three short chapters on crystallography, the chemical characters, and the physical properties of minerals are followed by a series of tables for the determination of 135 common species. In the choice of these species a considerable amount of judgment is shown, though it is obvious that the opinions of an American mineralogist as to what should be regarded as the most important species differ from those of workers in Europe. The tables are on the familiar plan of those of Weisbach, Persifor Fraser, Brush and Penfield, and other well-known authors, and the arrangement adopted is a very simple one. The twenty pages devoted to rocks at the end of the volume are only sufficient to enable the author to give a very slight sketch of petrographic science. The work is worthy of the attention of teachers organising a system of very elementary instruction in determinative mineralogy.

Laboratory Companion for Use with Shenstone's Inorganic Chemistry. By W. A. Shenstone, F.R.S. Pp. vi + 117. (London: Edward Arnold, 1901.)

MR. SHENSTONE'S course of work in inorganic chemistry was noticed in these columns a few weeks ago (January 10, p. 249). Most of the experiments in that book are reprinted in the present volume, together with a number of exercises, and other experiments have been added. A volume suitable for use as a laboratory manual, that is, containing directions and suggestions, without theoretical considerations, has thus been produced. On p. 117 reference is made to a frontispiece showing Fraunhofer lines, but the picture has been omitted.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

A Compact Method of Tabulation.

IN arranging tables of successive values of a variable quantity, it is often difficult to find a middle course between making the entries too numerous and making the intervals too large. I wish to call attention to a mode of tabulation which, although compact, provides facilities for the accurate deduction of intermediate values.

For convenience of description we may regard the tabulated values as equidistant ordinates of a curve. If the common distance is small enough (which implies that the number of ordinates is large), intermediate values can be deduced by the ordinary method of "proportional parts"—in other words by employing first differences only. If the number of ordinates is diminished by largely increasing the common interval, it becomes necessary to take account of differences higher than the first. We shall suppose the interval to be so chosen that the first three orders of differences—and no more—require to be considered.

A table showing the given values accompanied by three columns of differences presents a formidable aspect; and on the other hand, if the user of the table is left to compute these differences for himself, his labour is materially increased. What I wish to point out is that, without any sacrifice of accuracy, the first and third orders of differences can be omitted, the second only being retained; as in the following table of sines, which is suitable for computing the sine of any angle to four places of decimals. The differences entered opposite the sines are the "central" second differences; for example, −104, which stands opposite to sin 20°, is (sin 30° − sin 20°) − (sin 20° − sin 10°).

Angle	Sine	Second difference	Angle	Sine	Second difference
°			°		
0	·0000	− 0	50	·7660	− 232
10	·1736	− 52	60	·8660	− 263
20	·3420	− 104	70	·9397	− 286
30	·5000	− 152	80	·9848	− 299
40	·6428	− 196	90	1·0000	− 304

Let u_0 u_1 be any two consecutive tabulated ordinates (sines) between which it is desired to interpolate a new ordinate u; x_0 x_1 x being the corresponding abscissas (angles). Putting h for the common interval $x_1 - x_0$, let p stand for $\frac{x - x_0}{h}$, and q for $\frac{x_1 - x}{h}$, so that $p + q = 1$. Also let u_0'' u_1'' denote the central second differences of u_0 u_1 respectively. Then it can be shown that the value of u true to third differences is

$$pu_1 + \frac{p(p+1)(p-1)}{1.2.3}u_1'' + qu_0 + \frac{q(q+1)(q-1)}{1.2.3}u_0''.$$

The sum $pu_1 + qu_0$ of the two terms in u_1 and u_0, though it does not put first differences in evidence, really includes them, and is the exact value of u when the connecting curve is a straight line. In like manner, though third differences are not in evidence, they are implicitly contained in the sum of the two terms in u_1'' u_0''.

The coefficients of u_1'' u_0'' are identical in form, and are easily computed. The following list of their values for each tenth of an interval will serve to check mistakes. Their values (neglecting sign) are always less than ·065.

$$\frac{p(p+1)(p-1)}{1.2.3}$$

p		p		p	
·1	− ·0165	·4	− ·0560	·7	− ·0595
·2	− ·0320	·5	− ·0625	·8	− ·0480
·3	− ·0455	·6	− ·0640	·9	− ·0285

Two examples will show the working of the method.
To find sin 36°, we have $p = \cdot6$, $q = \cdot4$.

·6	(·6428)	= ·38568
·4	(·5000)	= ·20000
·064	(·0196)	= ·00126
·056	(·0152)	= ·00085
		·58779 say ·5878.

To find sin 72° 30′, we have $p = \frac{1}{4}$, $q = \frac{3}{4}$, giving $-\frac{5}{128}$ and $-\frac{7}{128}$ as the coefficients of $u_1'' u_0''$. Hence we obtain

$\frac{1}{4}$	(·9848)	= ·2462
$\frac{3}{4}$	(·9397)	= ·70478
$\frac{5}{128}$	(·0299)	= ·00117
$\frac{7}{128}$	(·0286)	= ·00156
		·95371 say ·9537.

Both these results are correct to the last figure.

The formula of interpolation here employed (which can be carried to higher terms when necessary) seems to be new. I gave it to Section A at the last meeting of the British Association, and have illustrated its use more fully in the *Journal of the Institute of Actuaries* for last month (January). It will also appear with other kindred matter in the next number of the *Quarterly Journal of Mathematics*. J. D. EVERETT.

Frost Fronds.

ON the morning of January 29, as I was walking from this place down Haverstock Hill into London, about 9.30, my attention was attracted by the "frost fronds" on the flags of the footpath. I see instances not unfrequently, and have called attention to one variety, where they form divergent groups, like the sticks of a partly opened fan, resembling the well-known crystals of actinolite obtained on the southern side of the St. Gothard Pass (see *Proc. Roy. Soc.* lxiii. p. 217, and *Quart. Journ. Geol. Soc.* liv. p. 368); but those now mentioned were characterised by unusual delicacy and grace. They formed groups, often half a yard in diameter, composed of frond-like radiating tufts, made up of thin stems or acicular crystals (often some four inches long and about the thickness of a bodkin) beautifully curved: this almost invariable bending of the "blades" being the most marked characteristic. They resembled very delicate seaweeds, dried and displayed on a card as an ornamental group. In descending the hill I observed that the crystals became a little coarser and more like those already mentioned. Also that sometimes clots of frozen mud appeared near the junction of the fronds, as if a trefoil or quatrefoil leaf had been placed there to hide it. I attribute the unusual delicacy of the fronds to the fact that the previous evening had been showery, and so the pavement had been cleaned of all but the very finest mud, after which had come a drying wind and a frost. Thus crystallisation probably occurred in a very thin film of slightly turbid water and on a fairly smooth surface, so that opposition to it was comparatively slight and the circumstances approached more nearly to the crystallisation of water on glass. I could not linger to make a minute study as I was pressed for time, but write this in the hope that some one who can take photographs (which I cannot) will collect examples of "frost fronds," for I believe they would be helpful in interpreting crystal building in rock masses. T. G. BONNEY.

23 Denning Road, Hampstead, N.W., January 31.

The Total Solar Eclipse of May 17–18.

THE Board of the Koninklijke Natuurkundige Vereeniging at Batavia has applied to the Government in regard to the custom duties to be levied from scientific observing parties who may visit the Dutch colonies for the observation of the total solar eclipse on May 17–18. The following reply has been received.

No duties will be levied on goods not exempted by the tariff, but destined to be re-exported after the observation of the eclipse has been concluded; observing parties may obtain further information from the chief Custom House officer at the port of arrival.

Besides all possible facilities in having their goods imported, exemption from search will be afforded to scientific expeditions.

We feel much pleasure in bringing the above under the notice of intending observing parties. J. J. A. MULLER.

January 1. (President of the Kon. Natuurk. Ver., Batavia).

The Museum of the Institute of Jamaica.

IN connection with your items regarding the possible return of Dr. J. E. Duerden, curator of the Jamaica Institute Museum, to England, may one who has spent two summers in Jamaica engaged in zoological research, and who has enjoyed the hospitality of Dr. Duerden and other men of science there, be permitted to say a word as to the causes which have led to the present unfortunate situation? There are two such principal causes, I believe, not closely related, but in this case working together toward a common end. The most important of these is local jealousy, against which Dr. Duerden has had to contend constantly ever since his arrival at the island. At the time he was appointed, a large and influential element among the supporters of the Institute desired the appointment of a young Jamaican, who had received some training in England, and who was doubtless well qualified for the duties of the position. His failure to secure the office was a bitter disappointment, not only to himself, but to his friends, and Dr. Duerden entered on his duties with an unfortunately large number of hostile critics, watching for opportunities to find fault. It is very possible—in fact, since Dr. Duerden is human, it is highly probable—that opportunities for criticism arose, and possibly the criticisms have not always been met in the wisest possible spirit. But it is clear to me, and I think I can speak for all the Johns Hopkins men who were in Jamaica, that if Dr. Duerden's local critics had been as anxious to help him and build up the museum as they were to find fault, there would be no trouble at the present time. I do not mean to say that Dr. Duerden has been entirely blameless, but I feel sure that his responsibility for the trouble is very much less than that which rests on his critics. The fact that Dr. Duerden is a trained investigator, and has given a large share of his time to research work, has given opportunity for criticism from those who believe the curator ought to devote his time to adding new specimens to the exhibition collection and labelling them all properly.

The other cause of the proposed retrenchment is one which appeals to me strongly, and must, I think, to all unprejudiced persons who know the facts. The colonial expenses are greater than the income, and the debt is already heavy. A very large proportion of the expense account is made up of salaries paid the English civil officials, from Governor down. The Governor receives a salary of 6000*l.*, besides two residences and the usual perquisites of his position. This salary is grotesquely enormous under the circumstances. Jamaica is not only a delightful place to live in, a veritable paradise in many respects, but it is a very cheap place as well. I should estimate, from my slight experience there, that living expenses are about three-fifths of what they are in the eastern United States. Most Englishmen in Jamaica do not realise or believe this, for they still cling to English food and English customs. Now the colony, a few years ago, attempted to secure the reduction of the salaries of colonial officials, and suggested a saving of 1000*l.* on the Governor's salary, but the proposition was promptly ended by that official's veto, which is absolute. So every attempt to decrease expenses by decreasing salaries has failed, and now retrenchment has to come somewhere, and since a zoologist is of small account, especially one who has some powerful enemies, Dr. Duerden is to be sent back to England. If this event actually takes place the blame will rest, not on Jamaica, but on England. There is little chance for the advance of scientific research in that island so long as it is looked on by English politicians as a possession to be exploited for the benefit of the office-holders.

I trust it is not yet too late for the scientific men of England to make such an emphatic protest to the proper authorities that the Board of Governors of the Jamaica Institute may be compelled to retain Dr. Duerden as curator of the museum, if he can be persuaded to stay, and if not, to secure some equally competent and well-trained investigator to fill his place.

HUBERT LYMAN CLARK.

Olivet College, Michigan, January 15.